Opener & Packer Training.

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Opener & Packer Training.

Outline

A. *Opener Styles.*
   i. *Single Shoot*
   ii. *Double Shoot*
   iii. *Fertilizer Coulters*
   iv. *Choosing the Right Opener*

B. *Packer Styles.*
   i. *Packing pressure – how much is enough?*
   ii. *Packer Materials*
   iii. *Packer Shapes*
   iv. *Packer Widths*

C. *Conclusions.*

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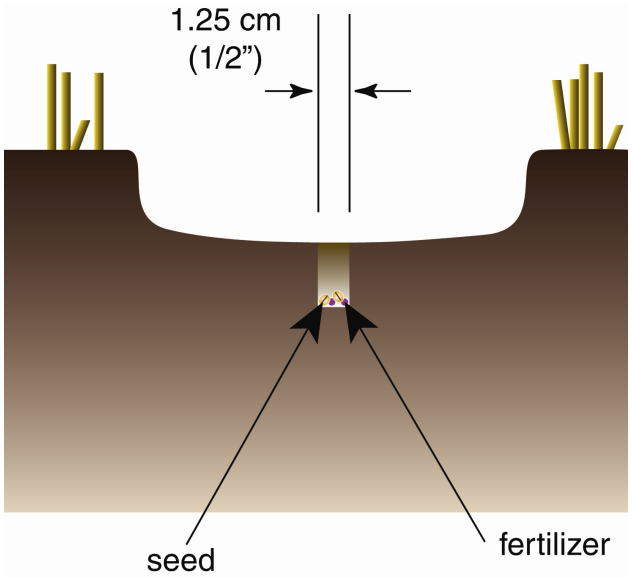
Opener and Packer Training.

A. Opener Styles.

i. Single Shoot.

- **Knife Openers.**



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Opener and Packer Training.

A. Opener Styles.

i. Single Shoot.

- **Knife Openers.**

  Strengths:

  - Low cost to outfit and maintain drill.
  - Easier to maintain consistent depth control with spring trip drills.
  - Reduced soil disturbance.
  - Excellent option for soils with high clay contents.

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Opener and Packer Training.

A. Opener Styles.

i. Single Shoot.

- **Knife Openers.**

  Limitations:

  - Only small amounts of fertilizer can be placed with the seed. ***NB: beware of P and K rates with broadleaved crops.***
  - Growers using these openers often apply mobile nutrients either by:
    - Spreading and incorporating additional fertilizer in one pass with the drill or
    - Using slow release fertilizer (ESN) in the seed row or
    - Banding nutrients in the same pass with fertilizer coulters or
    - Banding nutrients in a separate pass.

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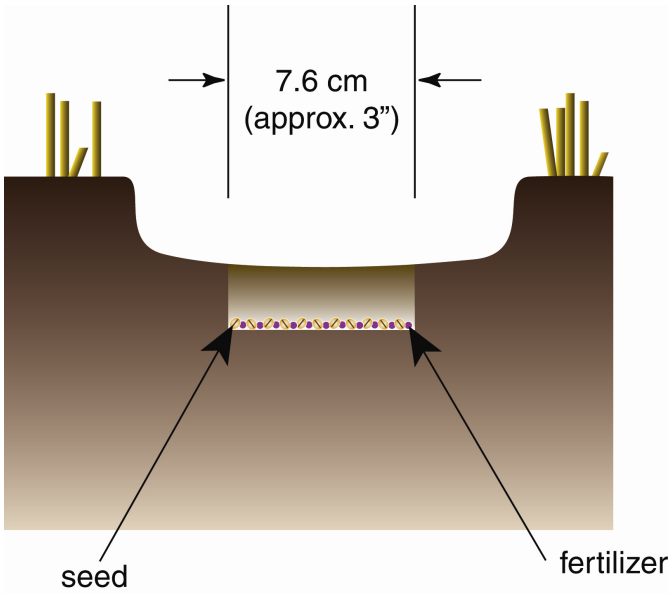
Opener and Packer Training.

A. Opener Styles.

i. Single Shoot.

- **Spreader Tips / Spoons.**



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Opener and Packer Training.

A. Opener Styles.

i. Single Shoot.

- **Spreader Tips / Spoons.**

  Strengths:

  - Low cost to outfit and maintain drill.
  - Moderate rates of fertilizer can be placed with the seed due to improved seed bed utilization (SBU).
  - This higher SBU is often associated with improved competition with weeds, swath support and water use efficiency due to more rapid canopy closure.

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A. Opener Styles.

i. Single Shoot.

- **Spreader Tips / Spoon Openers.**

  Limitations:

  - While the increased SBU of these openers allow growers to apply all the P and K necessary to maximize yields of all crops with good safety, generally not all N can be placed in the seed row.
  - Growers using these openers may apply additional fertilizer by either:
    - Spreading and incorporating additional fertilizer in one pass with the drill or
    - Banding nutrients in the same pass with fertilizer coulters or
    - Use ESN in the seed row or
    - Banding nutrients in a separate pass.

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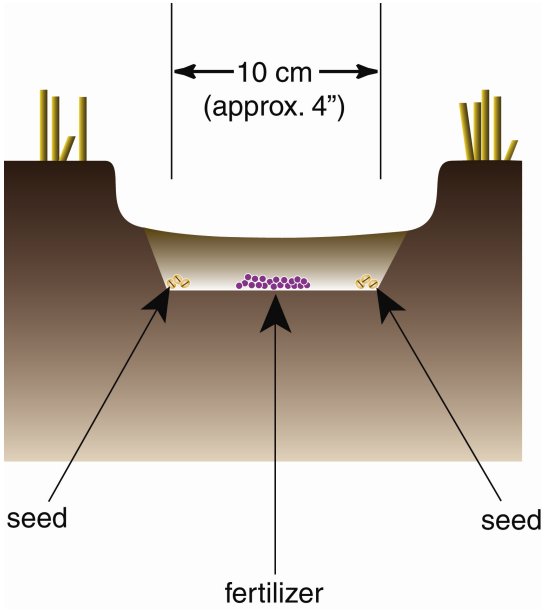
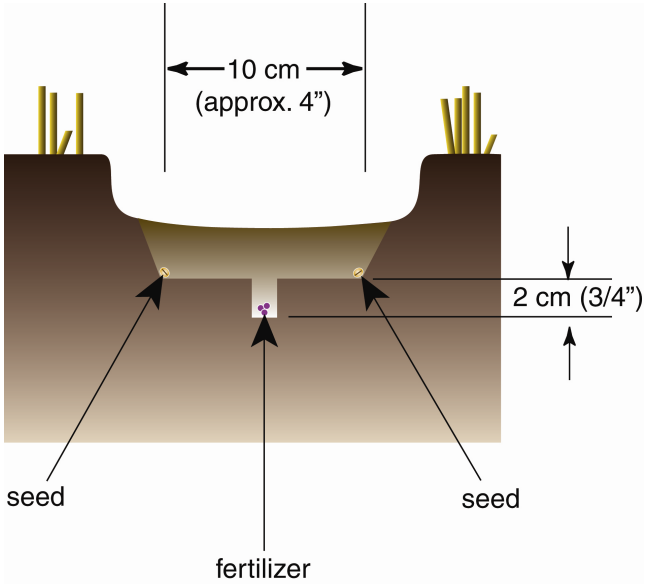
A. Opener Styles.

ii. Double Shoot.

- **Same Plane vs. to the Side & Below.**





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A. Opener Styles.

ii. Double Shoot.

- **Same Plane Advantages:**
  - Reduced soil fracturing / improved seedbed quality.
  - Reduced draft.
- **To the Side & Below Advantages:**
  - Fertilizer – seed separation.

Note: *soil disturbance, soil fracturing and draft are largely determined by the width of the opener nose. 2/3 of the draft & disturbance of the Morris Contour paired row opener comes from the ½ inch wide nose of the opener.*

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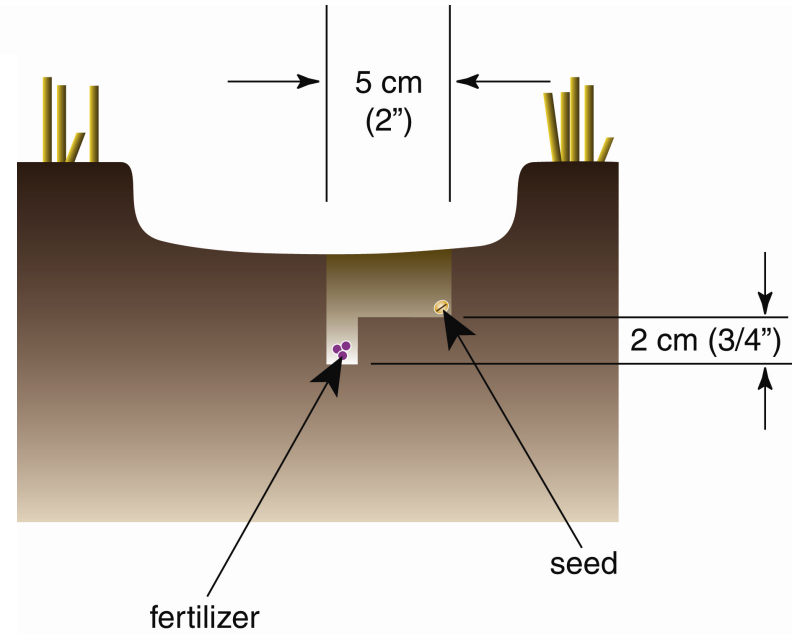
A. Opener Styles.

ii. Double Shoot.

- **Side band openers.**



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A. Opener Styles.

ii. Double Shoot.

- **Sideband Openers.**

  Strengths:

  - Moderate – high rates of fertilizer can be applied in a one pass operation.
  - A relatively small percentage of the seedbed is disturbed with these openers.

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A. Opener Styles.

ii. Double Shoot.

- **Sideband Openers.**

  Limitations:

  - With many broadleaved crops not all P and K fertilizer can be placed with the seed due to limited SBU.
  - There are significant differences in the design of side band openers. Depending on the design's impact on fertilizer – seed separation, this impacts maximum safe rates of fertilizer that can be applied.

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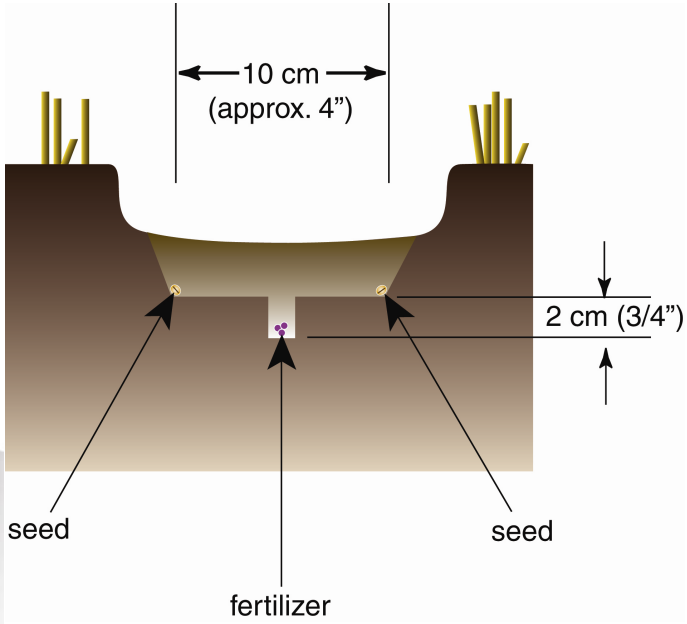
A. Opener Styles.

ii. Double Shoot.

- **Paired Row openers.**



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A. Opener Styles.

ii. Double Shoot.

- **Paired Row Openers.**

  Strengths:

  - Moderate – high rates of fertilizer can be applied in a one pass operation.
  - Higher rates of P and K can be seed placed with these openers due to increased SBU.
  - This higher SBU is often associated with improved competition with weeds, swath support and water use efficiency due to more rapid canopy closure.

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A. Opener Styles.

ii. Double Shoot.

- **Paired Row Openers.**

  Limitations:

  - These double shoot openers disturb a higher percentage of the seedbed.
  - There are significant differences in the design of paired row openers. Depending on the design's impact on fertilizer – seed separation, this impacts maximum safe rates of fertilizer that can be applied.

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A. Opener Styles.

iii. Fertilizer Coulters.

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A. Opener Styles.

iii. Fertilizer Coulters.

Strengths:

- High rates of fertilizer can be applied in a one pass operation with no risk of crop injury.

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A. Opener Styles.

iii. Fertilizer Coulters.

<u>Limitations:</u>

- Most expensive method of fertilizer placement (increases costs by 1/3 or ~ $1000/ft of drill).
- High repair and maintenance costs.

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A. Opener Styles.

iv. Choosing the Right Opener.

- **A farmer's opener choice will be based on a number of factors including:**
  - Wear characteristics.
  - Soil disturbance (moisture loss, weeds, field finish).
  - Row spacing (stubble for swath support).
  - General appearance (scouring).
  - Fertilizer – seed separation.
  - Seedbed quality.
  - Draft requirements.

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A. Opener Styles.

iv. Choosing the Right Opener.

- **Key opener choice characteristics from an agronomist's perspective:**

1. Fertilizer – seed separation.
2. Seedbed quality.
3. Row spacing (swath support, crop canopy).
4. Soil disturbance (moisture loss, weeds).

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A. Opener Styles.

iv. Choosing the Right Opener.

- **Are we too obsessed with soil disturbance and moisture loss?**
  - Some soil disturbance in our short growing season is positive more often than not. Blackening soil over the seed row helps warm the soil and this can hasten emergence and possibly buffer against spring frosts.
  - A tillage pass at 2-3 inch depth will release ~ 0.5 " of soil water if the soil is completely dried out.
    - ✓ A 4"opener/12" shank = 0.33 SBU X 0.5" = 0.17" loss.
    - ✓ A 2" opener/12" = 0.09" loss.

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A. Opener Styles.

iv. Choosing the Right Opener.

- **Fertilizer – seed safety.**
  - PAMI and AAFC scientists conducted a project from 2000-2002 comparing sideband fertilizer placement to fertilizer coulters. The study was conducted in all soil zones with a range soil textures and evaluated several fertilizer rates. Climate was not ideal over the three years.
    - The conclusion was that generally crop emergence, yields and grain protein were not impacted by different fertilizer placement systems.

<u>Note:</u> There are sideband openers and styles available today with superior fertilizer-seed separation than those used in this study.

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B. Packer Styles.

i. Packing Pressure - How Much is Enough?

What is the purpose of packing?

- Packing is used to improve seed germination and crop emergence uniformity.
- For seed to geminate it must imbibe water. To consistently imbibe water we pack the soil around the seed. This improves soil contact with the seed through breaking down large soil aggregates and reducing soil porosity. This reduced soil porosity allows water to move from higher soil moisture areas to the packed soil surrounding the seed.

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B. Packer Styles.

i. Packing Pressure - How Much is Enough?

- An extensive study was conducted a decade ago by PAMI comparing different packer shapes and down force. The study was conducted in with three different soil textures over the course of three years.
- The conclusion was that minimal packing pressure (70 lb down force) is required to optimize germination and crop emergence.

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B. Packer Styles.

i. Packing Pressure - How Much is Enough?

	Down Force (lbs)
Air Seeder with mounted packers	60
Air Drill with gang packers	130
Independent Opener Drills	70 - 200

Note: The shape and the width of the packer are important considerations in addition to the down force. This is because of how the force is directed (wider packers dilute the force across a greater surface, V shape packers direct the force to the center of the packer).

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B. Packer Styles.

ii. Packer Materials.

- **Steel**
  - Very durable/easily repairable. Good in stones and semi-arid regions. Poorest material for mud shedding.
- **Pneumatic (air filled tires)**
  - Best in wet areas with sticky soils. Air pressure can be changed with soil moisture conditions to fling off mud.
- **Semi-Pneumatic (rubber tires with a hollow void for flexing)**
  - Good in most soils. Excellent mud shedding with the added benefit of no flat repairs.

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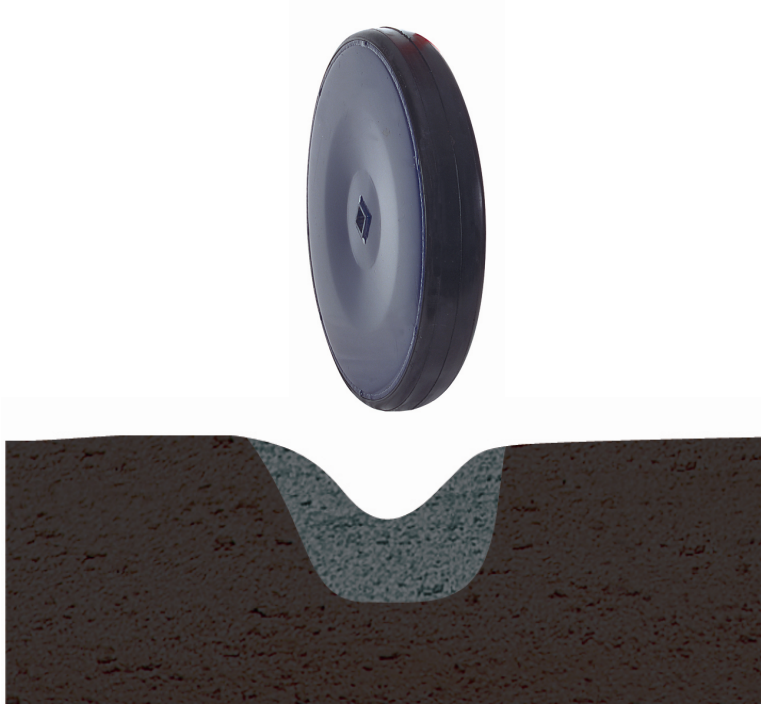
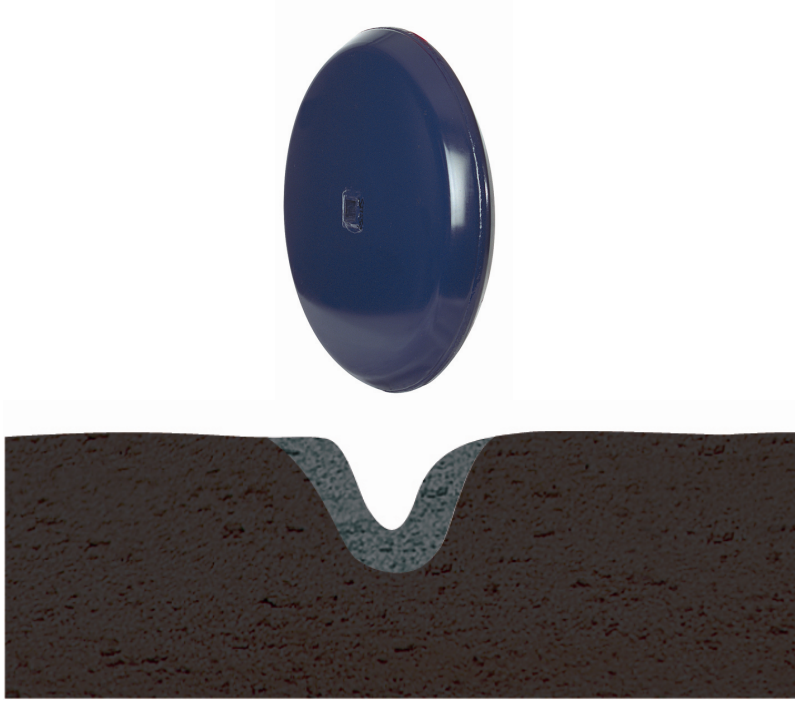
B. Packer Styles.

iii. Packer Shapes.





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B. Packer Styles.

iii. Packer Shapes.

- A flat shaped packer will apply force uniformly across the packing surface. This packer shape works well with double shoot openers and spreader tip openers.
- A V-shaped packer directs the force to the center of the packer. Packing force decreases progressively from the center to the edge of the packer. These packers work well with double shoot openers that place fertilizer below the seed.
- Beware of over packing with V-shaped packers with narrow knife openers in wet conditions.

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B. Packer Styles.

iv. Packer Size.

- The key consideration in choosing packer width is to make sure the packer is wider than the opener so that the placed seed is properly packed.
- Wider packers will disperse the down force across a larger surface area and reduce the possibility of over packing.

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C. Conclusions.

- There is no ‘one size fits all’ approach to opener choice. Opener choice needs to be tailored to both where and how the farmer farms.
- Double shoot openers and associated systems are not all created equal. Subtle differences in design may make one opener or system superior to others based on the individual farmer’s situation.
- Double shoot opener choice should focus on fertilizer-seed separation, seedbed quality and the desired row spacing. These elements have the most important role in setting crop yield potential.
- When choosing a packer, carefully consider where the force is being applied and ensure the packer is wider than the seedbed to ensure uniform and adequate soil to seed contact is achieved to promote rapid uniform crop emergence.

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Questions?

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